

WHAT IS CLAIMED:

Claim 1

A functioning substrate with a group of columnar micro pillars comprising:

5        a first matrix of organic polymer; and  
          the group of columnar micro pillars of organic  
polymer extending from said matrix;  
          wherein the equivalent diameter of each of said  
columnar micro pillars is 10 nm through 500  $\mu\text{m}$  with a  
10      height of 50 nm through 5000  $\mu\text{m}$ , and the aspect ratio  
          of equivalent diameter (D) to the height (H) of each  
          of said columnar micro pillars (H/D) is 4 or more.

Claim 2

The functioning substrate according to Claim 1  
15      characterized in that said group of columnar micro  
pillars is self-supporting.

Claim 3

The functioning substrate according to Claim 1  
characterized in that the aspect ratio of the  
20      equivalent diameter (D) to the height (H) of said  
columnar micro pillars (H/D) is 8 through 30.

Claim 4

The functioning substrate containing a group of  
columnar micro pillars according to Claim 1  
25      characterized in that the equivalent diameter of the

tip end of said group of columnar micro pillars is smaller than that of the bottom surface.

Claim 5

5       The functioning substrate containing a group of columnar micro pillars according to Claim 1 characterized in that the said group of columnar micro pillars has a portion tapering from the root in contact with said first matrix toward the tip end.

Claim 6

10      The functioning substrate according to claim 1, wherein at least part of the micro pillars has at its tip portion an expanded portion in the diametric direction.

Claim 7

15      The functioning substrate containing a group of columnar micro pillars according to Claim 1 characterized in that at least the surface of said group of columnar micro pillars is made of a substance mainly composed of a water-repellent and/or oil-repellent organic polymer.

Claim 8

20      The functioning substrate containing a group of columnar micro pillars according to Claim 1 characterized in that at least a part of the surface 25     of said group of columnar micro pillars is provided

with metal plating.

Claim 9

An optical device comprising:

a first matrix of organic polymer; and

5 a group of columnar micro pillars of organic polymer extending from said matrix;

wherein the tip end of said group of columnar micro pillars is in contact with the second matrix, the equivalent diameter of said group of columnar 10 micro pillars is 10 nm through 10  $\mu\text{m}$  with a height of 50 nm through 10  $\mu\text{m}$ , and the aspect ratio of the micro pillars of said group of columnar micro pillars is 4 or more;

15 said optical device being further characterized in that said group of columnar micro pillars is arranged in such a way as to form at least one optical path, and one or more light incoming sections and one or more light outgoing sections are provided.

Claim 10

20 The functioning substrate according to Claim 1 characterized in that part of said pillars is lacked to form clearances having a predetermined spacing.

Claim 11

A micro biochip characterized in that a group of 25 micro pillars made of a material including an organic

polymer is formed on the matrix surface of an organic polymer, and the equivalent diameter of said micro pillar group is 10 nm through 100  $\mu\text{m}$  with a height of 0.5  $\mu\text{m}$  through 500  $\mu\text{m}$ ; said micro biochip further  
5 characterized in that the aspect ratio of said micro pillar is 4 or more.

Claim 12

The micro biochip according to Claim 11  
characterized in that the organic polymer is modified  
10 on the surface of said micro pillar.

Claim 13

The micro biochip according to Claim 11  
characterized in that the organic polymer contains at  
least one of antigen, sugar chain and bases.

15 Claim 14

The micro biochip according to Claim 11  
characterized in that a plurality of micro pillar  
groups of organic polymer are provided in a flow path  
for feeding a sample and the tip end of said micro  
pillar is kept in contact with the upper substrate  
20 constituting the flow path.

Claim 15

A method for manufacturing a functioning substrate  
equipped with a group of columnar micro pillars, which  
25 is arranged on the matrix composed of a material

mainly of organic polymer so as to constitute a predetermined pattern, and which is provide with multiple bits having an equivalent diameter of 10 microns or less;

5        said method comprising steps of:

            applying pressure to a mold composed of a material harder than said material so as to press part of said material into said pit,

10        separating said mold from said material, and stretching part of said material in said pit, thereby forming a group of columnar micro pillars.

Claim 16

A method for manufacturing a functioning substrate equipped with a group of columnar micro pillars according to Claim 13, characterized in that a spacer made of inorganic material is formed on the first substrate and a material membrane is formed on the surface including said spacer, said method comprises the steps of:

20        pressing said mold against said membrane, separating said mold, and bringing the second matrix in contact with the tip end of said group of columnar micro pillars through said spacer and fixing it thereon.

25        Claim 17

A functioning substrate having a group of micro pillars made of organic polymer, wherein the micro pillars are self-supporting and arranged on a base member supporting the micro pillars, and wherein each 5 of the micro pillars has an aspect ratio of 4 or larger, a diameter of 1  $\mu\text{m}$  or less, and a height of 100  $\mu\text{m}$  or less.

Claim 18

The functioning substrate according to claim 16,  
10 wherein the equivalent diameter of one end of the micro pillars is smaller than that of the other end of the micro pillars, the ends of the micro pillars that have the smaller diameter being connected to the supporting member.

15 Claim 19

The functioning substrate according to claim 16,  
wherein a plurality of layers of the micro pillars are supported on the supporting member, each of the layers being bonded to supporting members.